06/21/06 BMtg Item
Chlorine Policy
Deadline: June 5, 2006

Department of Water and Power the City of Los Angeles

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June 5, 2006

Dena McCann
Division of Water Quality
State Water Resources Control Board
1001 I Street Sacramento, CA 95814

Sent via e-mail and U.S. Mail

Dear Ms. McCann:

Subject: Comments on the Draft Functional Equivalent Document for the Proposed Total Residual Chlorine and Chlorine-Produced Oxidants Policy of California (Policy)

The Los Angeles Department of Water and Power (LADWP) appreciates the opportunity to review the proposed Policy and provides the enclosed comments for your consideration (Enclosure).

LADWP incorporates by reference previous comments submitted to the State Water Resources Control Board on September 29, 2005.

As discussed in greater detail in the Enclosure, LADWP has conducted an extensive effort to demonstrate that our power plant discharges are not toxic, and yet compliance with the Policy would require the installation of dechlorination systems with expenditures of $1.8 million capital and $111,000 for operations and maintenance. The proposed Policy clearly places an inordinate share of the economic burden to comply with exceedances of Total Residual Chlorine (TRC) and Chlorine-Produced Oxidants (CPO) criteria on the power industry via installation of dechlorination, and also places an unnecessary burden on municipal drinking water system maintenance. LADWP believes there are numerous other chlorinated discharges that exist, and a statewide policy with a single limit that can be applied across the board for all these discharge types is scientifically flawed and unnecessarily stringent. The state may believe this Policy is practical from an

implementation standpoint, but it is not an equitable solution, nor is it necessary for the protection of aquatic life.

An alternative policy for intermittent chlorine discharges that considers the transient, short-term effects of chlorine is needed. Alternative approaches to sampling and monitoring intermittent discharges are also necessary. Lastly, the continued use of Best Management Practices (BMPs) for drinking water discharges associated with system operations and maintenance should be adopted.

If you have any questions or require additional information, please contact Clayton Yoshida at (213) 367-4651.

Sincerely,

Susan M. Damron
Manager of Wastewater Quality Compliance

c: Clayton Yoshida w/enclosures

Enclosure

Comments on Total Residual Chlorine and Chlorine-Produced Oxidants Policy of California

The Los Angeles Department of Water and Power (LADWP) has serious concerns about the proposed Chlorine Policy (Policy). We believe the Policy attempts to supersede long established existing site-specific decisions made by the regulatory agencies (items 1 and 2 below) and creates significant monitoring issues for intermittent and temporary discharges (item 3) with intermittent discharge times that should not be additive (item 4). The Policy is not justified by the California state laws cited in the staff's "Substitute Environmental Document" (SED, April 2006), and will not achieve its asserted purpose of producing "consistency" in the regulation of chlorine by the different Regional Water Quality Control Boards (items 5 and 6).

1. Preserve Existing Variances

The Policy attempts to supersede existing site-specific decisions made by the Los Angeles Regional Water Quality Control Board (RWQCB), the State Water Quality Control Board (SWRCB), and USEPA. LADWP's power plants have satisfied the requirement for modifications of "best available technology" (BAT) effluent limitations under §301(g) of the federal Clean Water Act, 33 U.S.C. §1311 (g), and in so doing, have demonstrated that the modified effluent limits (essentially site-specific water quality based effluent limits) are both protective of beneficial uses and serve the public interest. Modifications under §301(g) require a showing that, among other things, the modified requirements will comply with water quality-based permit limits more stringent than best practicable control technology. The demonstration must also show that the modified requirements will not interfere with the attainment or maintenance of water quality that will assure protection of public water supplies, the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities, in and on the water. Finally, the showing must satisfy the regulatory authorities that the modification will not result in a discharge of pollutants in quantities that may reasonably be anticipated to pose an unacceptable risk to human health or the environment because of bioaccumulation, persistency in the environment, acute toxicity, chronic toxicity or synergistic propensities (see 33 U.S.C. 1311 (g)(2)(C)). Thus, in order to satisfy the 301(g) requirements, LADWP had to prove that our discharges will be consistent with a balanced population of shellfish, fish, and wildlife and not pose an unacceptable risk to the environment (see Attachment 1, Site Specific and Effluent-Specific Analysis of Chlorine Impacts at LADWP Facilities).

During the 1980s, LADWP satisfied these requirements for its three generating stations. Using indigenous species of several fish, invertebrates and a plant approved by EPA, the SWRCB, and the RWQCB, we performed both acute and chronic toxicity tests on sensitive stages of the species for a full year. These tests showed that chlorine at the concentration called for by our existing permit limits was not toxic to these species.

In addition to these acute and chronic toxicity tests, EPA asked for a six-month study to look for possible synergistic effects with chlorine, chlorine byproducts, and brominated compounds. Again, these studies showed an absence of adverse effects.

Finally, EPA asked us to sample total residual chlorine at the "boil," where the discharge bubbles up into the receiving waters, and outward to the edge of the zone of initial dilution. We found that, under our existing chlorination practices, we could barely detect chlorine at the center of the bubble, and from there the concentration rapidly dropped to non-detectable. This was a site-specific demonstration proving that chlorine is rapidly reduced to non-detectable concentrations due to chlorine demand and volatilization. Because of the rapid decay and non-persistent nature of TRC and CPO, our studies and monitoring data show there is minimal exposure to aquatic life. Further, since our intermittent discharges are planned to be evenly spaced throughout a 24-hour period, it is not appropriate to sum the intermittent discharge times to obtain unnecessarily stringent instantaneous limits. Based on these studies, USEPA, SWRCB, and the RWQCB approved exemptions for our three facilities. In order to provide continuing assurance of aquatic life protection, we have been doing chronic toxicity testing since 1985. During those twenty years, only one or two of the chronic tests showed chronic toxicity, and in every case a retest showed that there was no problem. In short, both our original studies and our continuing testing for chronic toxicity demonstrate that chlorine in our discharges presents no threat to aquatic species. The granting of these variances represents a finding by the state (the State Board and the Regional Water Board) that our discharges will not compromise protection of the receiving waters for beneficial uses and that the public interest will be served.

None of the factual conclusions from our studies in our monitoring program are changed, of course, by the proposed Policy. New objectives for chlorine can in no way change the fact that the modified effluent limit requirements have been found to protect a balanced, indigenous population of shellfish, fish, and wildlife or that the existing discharges do not pose an unacceptable risk to the environment. Accordingly, the Policy should not disturb site-specific efforts undertaken to establish effluent limits protective of water quality and beneficial uses, should not require new studies or a re-petitioning to the RWQCB or SWRCB, and should not require any change to existing 301(g) modifications.

Table 1. History of the 301(g) variances.

Requirement	Fulfillment of Requirement
State must concur with 301(g) variance request	SWRCB Resolution 88-80, and the NPDES permit document that the alternate effluent limit meets state water quality standards and concurs with a 301(g) variance.
Pollutants must be non-conventional	CWA §301(g)(1) identifies chlorine as a nonconventional pollutant.
At a minimum, the variance must result in compliance with BPT and State WQS	SWRCB Resolution 88-80 documented that the proposed limitation will comply with WQS for TRC. EPA concurred with the Resolution 88-80

Requirement	Fulfillment of Requirement
	on February 15, 1989.
The variance must not result in additional requirements on other point and non-point sources.	USEPA agrees, documented in a letter dated May 13, 1988 from Region 9 to Department of Water and Power.
Will not interfere with the attainment and maintenance of water quality necessary to: – Protect public water supplies – Allow recreational activities in and on the water – Assure protection and propagation of a balanced population of shellfish, fish, and wildlife	USEPA agrees, documented in a letter dated May 13, 1988 from Region 9 to Department of Water and Power.
The [effluent limit] will not – Result in the discharge of pollutants which may reasonably be anticipated to pose an unacceptable risk to human health or the environment because of bioaccumulation, persistency in the environment, acute and chronic toxicity (including carcinogenicity, mutagenicity, or teratogenicity); or synergistic propensities. Section 301(g)(2)(C). – Result in the discharge of pollutants which may reasonably be anticipated to pose an unacceptable risk to human health or the environment because of acute and chronic toxicity or synergistic propensities	USEPA agrees, documented in a letter dated May 13, 1988 from Region 9 to Department of Water and Power.
Additional studies	See Attachment 1 for a description of toxicity monitoring.

Recommendation: Add the following statements prior to the Objectives: "This Policy does not change findings made by the Regional Boards or State Board, with approval by USEPA that a discharge will not compromise protection of the receiving waters for beneficial uses and that the public interest will be served, i.e., 301(g) variances and associated scientific studies. In these instances, the Policy recognizes that the discharge has met the State Water Quality Criteria on a site-specific basis. Existing dischargers with a current 301(g) variance from these objectives include:

A. Haynes generating plant

B. Harbor generating plant"

Note: The specific listing of facilities within a California policy document is not without precedent. LADWP cites the 1972 revision of the California Thermal Plan, page 2, where

facilities were specifically named as existing facilities for the purpose of regulation under the Plan.

2. The Legal and Factual Basis for the Chlorine Policy Is Unclear

What the proposed Policy would do is both set instream water quality criteria, or objectives, and at the same time set water quality-based end-of-pipe effluent limits at the same level, without any determination of "reasonable potential."

Under the federal regulations, a water quality-based permit limit is necessary only if there is a "reasonable potential" for causing or contributing to an exceedance of an instream criterion. The statewide Policy skips this step altogether and simply imposes a universal effluent limit regardless of the effect of the effluent on water quality. By comparison, for priority toxic pollutants, the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (2000)* (SIP/CTR) allows mixing zones and dilution credits (see §1.4.2). A Regional Water Quality Control Board may deny a mixing zone and dilution credit, but only "as necessary to protect beneficial uses" or to comply with the SIP/CTR or other regulatory requirements. For the draft Policy, the State Board's staff has made no finding that prohibiting mixing zones for chlorine is "necessary" to protect uses anywhere in the state, let alone everywhere, nor any explanation why the draft Policy for chlorine is different from the SIP/CTR.

Thus, the draft Policy would abandon the entire conceptual structure for calculating water quality-based permit limits. First, the draft Policy applies federal instream criteria everywhere, with no inquiry as to whether those nationwide criteria are appropriate for all California waters and all California species. The entire rationale for adopting the federal criteria seems to be that they have a "solid scientific foundation" and have been peer reviewed (SED p. 38) and therefore must be appropriate everywhere.

The draft Policy also disregards the fact that the federal chlorine criteria are expressly not intended for intermittent discharges. Then the draft Policy uses the instream criteria as end-of-pipe limits, ignoring the concepts of "reasonable potential," mixing zones, and dilution credits. The rationale for abandoning the established method of calculating water quality-based permit limits is that in "many" regions of California there is no assimilative capacity for dilution due to lack of flow in the receiving water, that chlorine is acutely toxic to aquatic life, that the Department of Fish and Game has a policy that no acutely toxic concentration of pollutant shall be present at the discharge point prior to dilution, and that "any amount of chlorine" may increase the "potential" of downstream fish kills and harm to aquatic biota (SED p.44). This reasoning, which relies on generalizations rather than data, is inadequate as a basis for abandoning both the federal approach to water quality-based permit limits, found in EPA's 1991 Technical Support Document, and the approach of the SIP/CTR.

Recommendation: Allow mixing zones to be applied, at each RWQCB's discretion, based on valid monitoring and study data.

3. Monitoring Issues
3A. Monitoring problems with intermittent discharges

The Policy requires continuous monitoring; however, the RWQCB may exempt facilities on a case-by-case basis where the discharger demonstrates, and the Regional Board determines, that continuous monitoring is inappropriate. However, the staff recommendations state that only small facilities where the Regional Board deems continuous monitoring is inappropriate should be exempted, citing as an example, small facilities with very small, intermittent discharges lasting minutes (SED 52).

This exemption is inadequate and should be expanded. For example, our power generating facilities use millions of gallons of seawater for once through cooling to which chlorine is added for control of bio-fouling of the condensers. Additionally, some intermittent flows as described below are not necessarily "very small." It should not be the smallness of the flow that determines the monitoring requirements, particularly if at times there is simply no chlorine to be measured.

Recommendation: The Policy should say that flows of any size, that discharge intermittently can appropriately be exempted from the continuous monitoring requirement.

Continuous monitoring is also a problem for other "intermittent" discharges like hydrostatic testing or groundwater dewatering that can span more than 2 hours, but is still short-term, intermittent, and not at a fixed permanent discharge location. These types of discharges are generally associated with projects that have a definitive beginning and end, but may discharge periodically (e.g., every 6 to 9 months) over the course of the project. For these projects, the discharge could be 4, 6, or 8 hours in one day or 4 to 8 hours for as much as 5 days and then no discharge for months. Lastly, these projects are mobile and can take place within the public domain (e.g., on residential or commercial streets). Establishing the means for, and conducting continuous monitoring of these discharge types is simply not feasible.

Consistent monitoring requirements throughout the State are not essential to protecting against chlorine acute toxicity, as stated in the Policy, but rather effective, site-specific monitoring. The power generating facilities have calculated at what time the peak TRC and Free Available Chlorine (FAC) residuals reach the sampling point and gather grab samples accordingly. Furthermore, TRC is not discharged from any single generating unit for more than 2 hours per day, which is typically broken down to 20 minute increments- once per condenser half per shift.

Lastly, in addition to the requirement for continuous monitoring, the Policy requires a back-up system either online or one which allows one grab sample every 15-minutes. Again, this requirement is unnecessary, especially for intermittent discharges. Presumably the Regional Water Boards may exempt facilities from the back-up monitoring requirement, but the Policy does not make this clear. The proposed Policy states that it is essential to have consistent monitoring frequencies in order to protect against acute toxicity (SED 52). LADWP believes

monitoring frequency should appropriately reflect permit needs (intermittent vs. continuous) and how well the monitoring represents of the discharge.

Recommendation: The Policy must redefine what is meant by an "intermittent" discharge. The two hour criterion is simply unworkable and appears to have been chosen arbitrarily. Furthermore, at a minimum, the Policy should make clear that "continuous" monitoring is not needed for intermittent discharges of chlorine. Discharges from temporary locations, which might have a duration greater than 2 hours should be exempt due to the difficulty of setting up a monitoring program. Existing BMPs with dechlorination chemicals should be sufficient to protect receiving waters due to the non-conservative nature of TRC and CPOs.

3B. Monitoring As It Relates To Instrumentation and Detection Limits

LADWP is concerned that currently available on-line instrumentation for continuous monitoring (e.g., once per minute) may not have the capability of delivering results with the required frequency or detection limit. The best cycle time available for the continuous analysis of seawater was found to be 2.5 minutes. This allows time for the analytical reagent to react with the TRC or CPO in the sample in order to get a readable result.

LADWP is also concerned about the detection limits of commercially available on-line and field monitoring systems. In order to do monitoring at temporary discharge locations (e.g., a hydrostatic test site, fire hydrant breakage, or water main flushing location), the Policy requires both continuous monitoring and 15-minute grab samples unless we obtain an exemption for continuous monitoring for each discharge occurrence. For these temporary discharge sites, a field test kit could be more appropriate instead of a permanent on-line system. The field test kit could be used to obtain 15 minute grab samples. However, a field test kit with spectrophotometer and a demonstrated method detection limit of 6 ppb had a Relative Percent Difference (RPD) of 28.6 for a freshwater sample (Attachment 2) for concentrations near the continuous limits in the Policy. This indicates that the Quantification/Reporting Limit (QRL) for the test is higher than the Policy limits. If such a test kit is not capable of good RPD of 15 or less, then we cannot expect an online instrument, which runs on the same principle of analysis, to do better. Moreover, for a saltwater matrix, interferences due to the components of seawater may cause enough increase of the RPD to cause the QRL to be higher. Another alternative would be to use amperometric titration, but this is not feasible in the field due to the delicate nature of the equipment (accuracy and precision may be lost while performing this test in the field). It will not be feasible to have many portable laboratories to be deployed with trained personnel at every water main rupture, broken fire hydrant, or field maintenance site.

For online systems, our staff found an instrument with a detection limit of 0.035 mg/l with an accuracy and precision of +/- 5% or 0.005 mg/l, whichever is greater. The detection limit is above the Policy's proposed limit and the analysis frequency is greater than once per minute. Thus, compliance with the Policy's monitoring provisions is not achievable.

Recommendation: Address situations where the QRL is greater than the exposure limit. Allow tests with higher QRLs and detection limits, especially when the assimilative capacity of the waterbody allows the chlorine to be reduced rapidly. To avoid exceedances caused by analytical noise, allow exceedances to be determined based on the site-specific QRL, not a vendor's detection limit. Allow the use of currently available online instrumentation with a longer analysis cycle.

3C. Monitoring in Public Situations is Problematic

LADWP handles numerous drinking water system maintenance and repair tasks per month which discharge tap water to the street or nearby catch basins. These tasks include, for example, hydrostatic testing of pipes, water line flushing and regulator blow offs (releases of potable water to regulate system pipeline pressure). Emergency activities include water main ruptures and fire hydrant knock-offs, where the priority is to shut down the discharge to protect people and property rather than mobilize a monitoring plan. Since chlorine is volatile and easily reduced prior to discharge to a waterbody, these temporary discharges should be exempt from the policy. Moreover, given the temporary and unpredictable nature of these activities, it would be difficult to mobilize a temporary monitoring program for any of the aforementioned projects.

Another activity often covered by general NPDES permits, dewatering, does not involve drinking water or the use of chlorine. Nevertheless, these general permits often contain a Basin Plan TRC limit and should not be covered under the Policy.

Recommendation: Allow discharges associated with drinking water system maintenance and repair for public water supply to be exempt from the Policy and monitoring requirements.

3D. Monitoring every 15 minutes

Monitoring intermittent discharges by collecting grab samples every 15 minutes for some situations, such as hydrostatic testing, dewatering, and well development is unnecessary, since the TRC value in a discrete volume of hydrotest discharge is expected to be stable throughout the course of the discharge and the TRC concentrations in groundwater are expected to be zero.

Recommendation: Under situations where discharge water quality is not expected to change throughout the event (the water remains the same), 15 minute monitoring should not be required.

3E. Receiving Water Monitoring May Not Be Needed or Helpful in Some Circumstances

The draft Policy states that receiving water monitoring is required if a grab sample is above the exposure limit. Again, this would be problematic for intermittent dischargers, whether less than 2 hours per day or periodically over several days. Temporary dischargers would be

required to search for a safe and representative monitoring point at a receiving water potentially miles away from the discharge point. At this point, monitoring the receiving water in many cases would not be helpful, as chlorine dissipates rapidly after discharge. Thus, the time and effort associated with the logistics and mobilization of receiving water monitoring will not be helpful in adjusting intermittent dosages of chlorine or dechlorination chemical.

For illustrative purposes of the above comment, LADWP also discharges intermittent flows to fresh water ecosystems via the storm drain system. Periodic releases of potable water from the John Ferraro Office Building's reflecting pool are directed to the storm drain. The total residual chlorine limit was established at 0.5 mg/L; however LADWP requested that the limit be increased to 1.0 mg/L to achieve adequate algae control. LADWP, at the request of the Regional Board, conducted a study in 1982, the results of which indicated that even for chlorine levels of 0.84 mg/L at a worst case dilution of 5:1 with the flow in the Los Angeles River (approximately one-half mile distant), the total residual chlorine was undetectable (<0.02 mg/L) prior to its discharge entering the Los Angeles River.

As mentioned previously, existing BMPs with dechlorination chemicals should be sufficient to protect receiving waters due to the non-conservative nature of TRC, especially when the discharge travels along a street, then enters a catch basin and the storm drain system. As the water travels towards a receiving waterbody, any remaining TRC would have low concentration and either volatilizes or is reduced by existing organic matter.

Recommendation: For the reasons stated above, state in the Policy that receiving water monitoring for temporary intermittent discharges are not required by this policy.

3F. Multiple Grab Sample Violations for A Single Discharge Event Is Not Helpful Or Constructive

On page 7 of the draft Policy, non-compliance for each grab above the limit is considered a separate violation. Given that dischargers will be continuously trying to adjust the de-chlorination chemicals, and that harm is minimal due to dispersion of the chlorine, having multiple violations for a single event is not appropriate. Furthermore, Water Code Section 13385(f)(1) indicates that it is not the intent of the state to seek multiple violations, minimum mandatory penalties or other such non-compliance claims for multiple violations, due to a single upset (e.g., malfunctions associated with a chlorination or dechlorination system or its monitoring).

Recommendation: State in the Policy that multiple exceedances due to a single chlorination or dechlorination process malfunction shall be treated as a single violation.

4. Summing the Times of Intermittent Discharge is Inappropriate

Intermittent discharge times during a 24-hour period should not be summed to determine the intermittent exposure limit, nor for determining if a discharge is intermittent or continuous.

This is because the time between intermittent discharges offers aquatic organisms a recovery time, which increases the amount of tolerable TRC.

The Mattice and Zittel study cited by the SED shows the relationship between exposure time and chlorine dosage. As expected, as the exposure time is reduced, the toxicity threshold value increases. However, the study does not address a situation where there are recovery times between intermittent exposures. The toxicity of discharges of chlorine that are intermittent, rather than continuous, is much lower than continuous exposure would be. Therefore, it is not appropriate to use a sum of the discharge times in a 24-hour period in order to calculate more stringent instantaneous exposure limits or revert to the more stringent continuous limits provided by the Policy. In a study done for the Utility Water Act Group in 1989, researchers at the University of Wisconsin exposed a species of fish, a snail, and daphnia that were known to be highly sensitive to chlorine. The tests were designed to expose the animals to chlorine under environmental conditions they would commonly encounter in the field. Table 5.1 from that study (Attachment 3) shows the reduction in toxicity due to intermittent exposures.

The researchers found that monochloramine exposures of two hours' duration, administered four times in a 96-hour period, were five to seven times less toxic to fish (rainbow trout and common shiners) than continuous exposures administered over the same time period. [Note: the two hour increment for this study was selected because of the power plant effluent guideline limit duration and was not an arbitrary time period selection.] Chronic, sixty-day tests with early lifestages of the rainbow trout showed that intermittent exposures were approximately nine times less toxic. Tests with the water flea (daphnia) indicated that intermittent exposures were three to five times less toxic than continuous exposures. Tests performed with the snail, which can withdraw into its shell when chlorine is present, indicated that the animal can withstand intermittent exposures one hundred times higher than those administered continuously. The researchers concluded that a strong case could be made for the development of specific water quality criteria for intermittently chlorinated effluents. This is because the reduced toxicity is caused by the recovery time provided between exposures. Further, the data indicated that these criteria should be significantly less stringent than those presently in existence. A. Brooks, D. Szmania, and M. Goodrich, Special Report No. 39: A Comparison of Continuous and intermittent Exposures of Four Species of Aquatic Organisms to Chlorine (Center for Great Lakes Studies and Department of Biological Sciences, University of Wisconsin-Milwaukee) (March 1989) (report for the Utility Water Act Group, submitted to EPA in 1989).

In 1990 EPA's Assistant Administrator for the Office of Water, LaJuana Wilcher, issued a memorandum to states and EPA Regions discussing the possibility of site-specific criteria to protect water quality from intermittent point source discharges of chlorine, such as the "pulse" discharges typical of the steam electric industry. (The same principles would govern any intermittent discharge of chlorine, such as from drinking water supply systems.) Ms. Wilcher acknowledged that a chlorine standard could be derived that would accommodate relatively higher peak levels, such as those caused by periodic power plant condenser tube cleaning, while maintaining long-term levels low enough to protect against environmental impact. She validated the Brooks data, calling it "very useful data." The memorandum

pointed out that not only criteria concentrations but also exceedance parameters may be adjusted on a site-specific basis, if sound data so indicate, and that such modifications are "acceptable in principle." Ms. Wilcher also noted that some evidence exists that some environments can tolerate short-term exceedances of EPA's existing chlorine criteria, provided they are followed by suitable recovery periods, and that situations involving periodic cleaning with chlorine may be "good candidates for such site-specific modifications of the chlorine criteria." Memorandum, LaJuana S. Wilcher, Assistant Administrator, EPA Office of Water, to Water Management Division Directors (Regions 1 -X) and State Water Pollution Control Administrators, *Chlorine Criteria: Consideration of Intermittent Discharges* (December 11, 1990). See Attachment 4.

Recommendation: Allow each intermittent discharge time to be counted separately, not summed over a 24-hour period for the determination of the intermittent exposure limit.

5. Consistency is an Insufficient and Counter-productive Justification for the Policy

The goal of the draft Policy is to achieve "consistency" in the treatment of chlorine discharges statewide, and it seeks to do so by setting a single set of instream objectives that would apply everywhere and then by requiring the same objectives as an end-of-pipe limit everywhere. We fear, however, that this "consistency" will prove illusory. In the first place, as a matter of chemistry and biology, the behavior of chlorine in surface waters is different from place to place, depending on waterbody type, local water chemistry, and what species are present. No regulatory policy can impose consistency where Nature herself is not uniform. By failing to recognize this natural diversity, the Board will only transfer the scientific issues to the process of setting site-specific objectives (SSOs), which are the burden of the Regional Boards. On that ground alone we ask the Board to reconsider the wisdom of the proposed objectives and the no-mixing-zone policy.

Recommendation: Allow the RWQCBs to continue setting criteria for TRC and CPO based on: (1) the current achievable detection limits, (2) the non-conservative nature of chlorine, and (3) the assimilative capacity of the receiving water. Continue to allow mixing zones and dilution credits where appropriate, according to federal regulations. Allow flexibility of monitoring requirements, depending upon the type of discharge.

6. Policy is not required

The proposed Policy is not required, or even justified, by the California state laws cited in the SED. The legal reasoning in the SED seems to be that the Clean Water Enforcement and Pollution Prevention Act of 1999 (SB 709), by creating Mandatory Minimum Penalties (MMPs), created a situation in which occasional spikes in chlorine concentrations will trigger penalties in a way that is inconsistent from one Regional Board to another. As the SED put it, "with the implementation of SB 709, the ability to interpret violations has been greatly limited for the Regional Water Boards, subjecting dischargers to multiple MMP enforcement actions when in fact the violations may be a monitoring artifact." SB 709 did not make the regulation of chlorine more complex, only enforcement. The enforcement inconsistency can and should be remedied by means other than development of a statewide Policy. The

proposed Policy goes on to suggest that what is really needed are sampling procedures that are "representative" of discharges and procedures that are consistent among all the nine Regional Water Boards (SED, p. 7). The SED also implies that the draft Policy is justified by the requirement for basin plans under the State Porter-Cologne Water Quality Act and by the requirement that the State Water Board adopt state policy for water quality control (SED p. 10). Lastly, the SED states that it is required to establish effluent limits for chlorine under the SB 709 added provision of CWC § 13263.6. But none of these state laws requires the Board to adopt any of the proposals in the draft Policy. Furthermore, § 13263.6 is a trigger only for POTWs, and only for those substances that have been reported under Emergency Planning and Community Right to Know Act (EPCRA) where a reasonable potential exists for those same substances to cause a water quality standard excursion.

Recommendation: For the reasons stated above, SWRCB should consider that a uniform policy for the State may not be needed. Even the most flagrant exceedances caused by negligence can be handled by the RWQCBs.

7. Historical Violations Need to be Categorized

On page 61 of the SED, the number of violations for all dischargers were described. The SED states "the above violations resulted in recorded fish kills and negative effects on aquatic life..." The implication of this statement is that any discharge above the Policy's proposed Water Quality Objectives (WQO) will result in fish kills and negative effects on aquatic life. Yet as previously noted, LADWP, via its state exception and Federal 301(g) variance, has been operating for over 20 years at discharge limits significantly above the Policy's proposed WQO with demonstrable evidence of no fish kills or adverse effects. LADWP believes that this serves to illustrate two things. One, a statewide chlorine policy cannot address the site-specific responses of chlorine in the receiving water environment. Two, the Policy is flawed when it attempts to make broad sweeping justifications for its existence.

Recommendation: Evaluate the historical violations and fish kills and place them in the proper context if they are to be used as justification for having a statewide chlorine policy. An analysis of the extent of environmental improvement for these discharges causing fish kills should be included due to the economic impact on the public.

8. Cost estimates

LADWP reviewed the economic analysis (April 2006) provided by the SWRCB, in particular, the description for the power plants of Pacific Gas and Electric at Hunters Point (page A-8) and Duke Energy LLC at Chula Vista (page A-33). These plant capacities are 709 and 396 megawatts, respectively. LADWP's Haynes and Harbor plant capacities are 1619 and 316 megawatts, respectively. As might be expected, the design of a dechlorination system needs to be site-specific based on factors such as cooling water flow, effective chlorine dosage, contact time for the dechlorination chemical, location of the generating units in relation to chemical storage, and available space. Accordingly, LADWP undertook an effort to estimate the capital cost (for total system installation) and the annual O&M cost for

a dechlorination process using sodium bisulfite with the best chlorine monitoring instrumentation currently available on the market. In the estimate, we assume all installation can be installed above ground and there are existing spare conduits available for running the power and control/data cables. The estimated capital cost in 2006 dollars is $1.3 million for the Haynes plant and $500,000 for the Harbor plant. The annual O&M cost including chemicals is $84,000 and $27,000 for the Haynes and Harbor plants, respectively. Refer to Attachment 5 for a breakdown of the costs.

Given the capital costs of $1.8 million and annual O&M of $111,000 for both power plants, LADWP questions the environmental benefit to be gained when contrasted with the quite significant costs to install dechlorination to achieve the Policy's WQO. As previously commented, LADWP demonstrated (in pursuit of its state exception and federal variance), and continues to demonstrate, that its site-specific TRC limits are protective of aquatic life and beneficial uses. LADWP questions, therefore, what environmental benefits will result by the expenditure of the $1.8 million capital and $111,000 annual O&M to install and operate a dechlorination system that is clearly not needed.

Summary

In short, the draft Policy does not allow for past site-specific decisions based on science to provide appropriate criteria that are protective; it does not consider temporary discharges due to maintenance and repair of the potable water system; it does not address real world detection levels or QRLs and the difficulties in mobilizing to monitor intermittent discharges in the field. None of these reasons can justify a policy that is arbitrary and unfair, especially to intermittent dischargers.

Miscellaneous Clarification Needs in the Policy or SED

Page 6, Monitoring Requirements section: Water main breaks, hydrostatic tests, or other water system maintenance and repair projects should be exempt from continuous monitoring. We should not need to apply in every instance for an exemption to continuous monitoring.

Page 7 top paragraph: The term "solution" needs to be identified more specifically in the sentence, "Facilities must verify the solution concentration by Method 4500-Cl E as found in Standard Methods for the Examination of Water and Wastewater, 20th Edition". It is not clear if method 4500-Cl E is used to verify the calibration stock standard, the solutions in the calibration curve, a quality control sample, or some of the samples collected during discharge. Also, method 4500-Cl E is an amperometric titration method, not suited for field use (as mentioned previously).

Page 39 of the SED states that the equation $C=1070/T^{0.740}$ is appropriate for ocean dischargers; therefore, the additional equation for intermittent CPO on page 4 of the Policy is not necessary. Delete the intermittent CPO equation from the Policy.

Site-Specific and Effluent-Specific Analysis of Chlorine Impacts at LADWP Facilities

Background

LADWP began its extensive study on the effects of chlorine associated with its coastal power plants as a result of modifications to the Ocean Plan. The 1978 Ocean Plan introduced the concept of initial dilution and established receiving water quality objectives for, among other things, chlorine. Negotiations with State Board staff over the appropriate mixing zone model and calculation approach culminated with an approved method in 1985. At this time, LADWP and the Southern California Edison (SCE) responded that the resulting effluent limit could not be met without costly physical modification to the condenser systems or installation of a pre-discharge dechlorination system. The Staff Report by the State Board's Division of Water Quality stated, "With this realization, the chlorine water quality objectives and dilution equation came under more scrutiny. It was very quickly realized that the dilution equation did not consider the non-conservative nature of chlorine." LADWP and SCE were advised that they could pursue an exception.

Upon review of the exception request, State Board staff found that the exception could not be granted to the dilution criteria itself since dilution affects all discharged constituents equally. Instead, "based on the non-conservative nature of chlorine", the effluent limitations could be modified if the receiving water objectives were met so as to ensure that the beneficial uses were protected. The State Board reported that the literature references have shown that "approximately 80% of the applied chlorine is rapidly inactivated when added to filtered seawater. Attempts to quantify the inactivation (reduction to chloride) of chlorine have been somewhat successful." The Staff Report continues to point out that, "The 80% reduction of chlorine reported by Goldman et. al. does not account for chlorine reduction by non-filterable organic matter or reduction by surface growth in the diffuser delivery system." The Staff Report notes that the SCE chlorine dispersion study at seven of their power plants had no detectable total reduced oxidants. Lastly, the Staff Report found that a number difficult estimations and unknowns (e.g., relative toxicity, since it is strongly site and time specific, and toxicity of an intermittent discharge) necessitated the performance of a biomonitoring program. Thus, although historical monitoring data and special studies indicated no significant impact on beneficial uses at historic times of significantly greater chlorine usage, it was in the public's interest to acquire "accurate scientific data regarding the discharge of toxicants to the marine environment and their potential impact on the ecosystem."

Biomonitoring Program

The state and EPA approved biomonitoring program consisted of the following:

- A spatial categorization of the nine power plants into three siting characteristics: (1) open coast (nearshore and submerged); (2) harbor; and (3) shoreline. [NOTE:

for purposes of the Chlorine Policy, only Categories 2 (embayment) and 3 (river/estuarine) apply.]

- A temporal categorization to account for the three oceanographic seasons (Upwelling Mar. - Jun.; Davidson Jul. – Oct.; and Oceanic Nov. – Feb.) and the two periods of diverse terrestrial inputs (rainy season and dry season). Thus, the biomonitoring program spanned a duration of approximately 10 months.
- A biomonitoring program based on the selection of three species (fish, invertebrate, plant). [NOTE: the tests involved 3 species of fish, 4 species of invertebrates, and giant kelp.]
- An experimental design which required that (1) power effluent water be chlorinated in the lab to the requested modified/proposed effluent limits; (2) dilution water be collected from an area unaffected by the plant effluent; (3) range-finding concentration tests of 100%, 56%, 10%, 5.6%, 1.0%, and dilution control water; and (4) organisms were added to the test chambers immediately following completing the dilution concentrations.

The results of the monitoring program and the State Board Resolution 88-80 granting the exception found:

NOELs were determined for each species.

The lowest NOEL for the most sensitive species, giant kelp, was 58 ppb. State Board Staff interpreted this to mean that marine life will not be harmed by intermittent discharges of residual chlorine that yield concentrations below 58 ppb after initial dilution because no effect was found at this level.

The dischargers have submitted evidence, including results of toxicity tests on indigenous marine organisms, to show that the alternate total residual effluent limitations are adequate to protect beneficial uses.

Receiving Water Monitoring Program

In addition to the state requested biomonitoring program, EPA Region 9 requested supplementary data to assist in evaluating the 301(g) variance applications from the Best Available Technology limit of 0.2 mg/l for chlorine. A receiving water monitoring study was required to assess the level (persistence) of chlorine residual remaining in the receiving water after discharge. The Receiving Water Monitoring Study consisted of:

- The nine power plants were placed in the same grouping as for the biomonitoring study; namely, open coastal, harbor, and shoreline (river/estuary).
- Two field surveys were conducted at each location, July and August, 1987.
- Total Residual Chlorine (TRC) was amperometrically titrated in the field to determine the residual concentration at the discharge boil, at multiple locations along the boat's drift line, and at a farfield background station.
- Water chemistry analyses were also conducted for ammonia, bromide, suspended solids, trihalomethanes, and pH.

- At the harbor (embayment) plant, TRC effluent concentrations ranged from 0.14 mg/l to 0.31 mg/l, with TRC at the discharge boil ranging from non-detect to 0.25 mg/l. The TRC concentration with distance from the boil along the drift line ranged from non-detect to 0.07 mg/l (the latter at 20 feet from the boil). The TRC concentration at the farfield station was non-detect.
- At the shoreline (river/estuary) station, TRC at the discharge boil ranged from non-detect to 0.08 mg/l. TRC concentration with distance from the boil along the drift line ranged non-detect to 0.07 mg/l (the latter at 20 feet from the boil). The TRC concentration at the farfield station was non-detect. [EPA noted that "this concentration is well below the proposed modified limit, thus, receiving water chlorine concentrations may be significantly underrepresented."]

Effluent Monitoring Program

EPA Region 9 requested supplementary data to assist in evaluating the 301(g) variance applications from the Best Available Technology limit of 0.2 mg/l for chlorine. The Effluent Monitoring Study was required to determine whether chlorine, along with any other pollutants present, was persistent or synergistic. The Effluent Monitoring Study consisted of:

- The nine power plants were placed in the same grouping as for the biomonitoring and receiving water studies; namely, open coastal, harbor, and shoreline (river/estuary).
- Monitoring occurred at the same three representative plants.
- Sampling and analysis of the wastewater discharge occurred during and within 30 minutes after chlorination for chlorine, bromine, ammonia, and all priority pollutants at specified frequencies (e.g., twice per week, weekly, monthly and bimonthly) for a period of six months.
- Monitoring was conducted between March and August of 1987.

With regard to the issue of persistence, EPA concluded that "the monitoring data demonstrated that the monitored pollutants were either non-detectable or at very low levels" and that "these pollutants are not persistent and are not a threat to sensitive aquatic life."

With regard to the issue of synergism, EPA reviewed the effluent monitoring data in concert with the biomonitoring data and found that the discharge did not have any synergistic properties.

Conclusions

Compliance with the new total chlorine residual limitations would require large capital costs and the public interest would not be served by requiring such expenditures since they appeared unnecessary to protect beneficial uses.

COMPARISON OF LOW LEVEL CHLORINE MONITORING INSTRUMENTATION FOR STREAM MONITORING

Sara Ward and Tom Augspurger, U.S. Fish and Wildlife Service, Raleigh, NC

Dwarf wedgemussel (Alasmidonta heterodon)

Abstract

Chlorinated wastewaters have the potential to impact habitat for threatened and endangered mussels. Limited information indicates that mussel exposures to chlorine may be significant and, in some cases, exceed concentrations shown to be harmful. Due to the extreme toxicity of chlorine to aquatic life, federal water quality criteria and many state standards are set at concentrations less than 20 parts per billion (ppb or µg/l). Many field instruments for chlorine analyses cannot attain detection limits as low as these standards. Chlorine is also highly reactive and volatile, and the U.S. Environmental Protection Agency's recommended maximum 15 minute holding time for total residual chlorine (TRC) analysis often precludes a laboratory-based approach. This makes accurate measurement of ambient chlorine concentrations a challenge. For instream monitoring of selected mussel habitat in North Carolina, several portable low level (0 - 500 ppb) chlorine detection systems were laboratory- and field-tested. Results of the benchtop comparison of chlorine measurement protocols and instrumentation prompted selection of a N,N-Diethyl-p-Phenylenediamine (DPD) colorimetric method with a demonstrated method detection limit of 6 ppb. Use of this method in the field has resulted in accurate (coefficient of determination from 5-point calibration curves averaging 0.996) and precise (relative percent deviations for duplicate samples averaging 14%) low level measurements of TRC over a range of 6 to 300 ppb. The approach is likely to be useful for various applications including routine discharge monitoring and assessment of chlorine toxicity threats to mussels and other fauna.

Introduction

Chlorine is extremely toxic to aquatic life. Federal water quality criteria and many state standards are less than 20 ppb (USEPA 1985).

Accurate measurement of ambient chlorine concentrations is a challenge. Chlorine is highly reactive and volatile. U.S. Environmental Protection Agency (USEPA) recommends a maximum 15 minute holding time on samples for chlorine analysis (USEPA 1983).

Chlorine is often not included in routine water quality monitoring programs because of these logistic concerns.

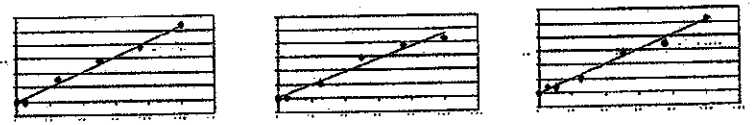
To measure total residual chlorine (TRC) concentrations in freshwater mussel habitats, we conducted a lab- and field-based performance comparison of chlorine measurement instrumentation.

DPD colorimetric low-level chlorine detection instrumentation for field monitoring.

Methods / Results

Lab- and field-based performance comparisons were conducted with two amperometric titrators (Fisher Cl Titrimeter Model 397 and Wallace and Tieman Series A-790) and a spectrophotometer (HACH DR/2010)[1].

Total residual chlorine detection instrumentation performance comparison: laboratory-based standard curves[1]



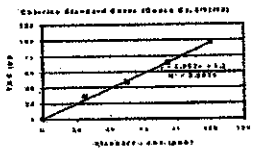
[1] Standards prepared immediately prior to analysis using chlorine standard ampules

Though amperometric titrators performed reasonably well in the lab and the chlorine detection protocol using these systems is associated with fewer chemical interferences, they were not conducive to field use (reading unsteadiness, design limitations, inability to achieve reliable standard curves).

We selected the low-range chlorine detection DPD method using the HACH DR/2010 with a demonstrated method detection limit of 6 ppb:

1. System designed for field use (physically and functionally more stable when operated using vehicle battery power).
2. Accurate (coefficient of determination from calibration curves averaging 0.996) and precise (relative percent deviations for duplicates averaging 14%) measurements of TRC over a range of 6 to 300 ppb were achieved in the field.
3. Protocol does not require a high level of expertise.
4. Protocol can be modified to correct for some chemical interferences (e.g., Mn). High turbidity and color in receiving stream still problematic.

Field applications were accurate



Field applications were also precise

Note: average RPD for these three sites is 14%

Station	TRC (ppb)		RPD (%)
	Replicate 1	Replicate 2	
Goose Creek at WWTP outfall pool	180	163	1.85
Fishing Creek (100 meters below WWTP outfall)	271	302	10.8
Swift Creek	16	12	28.6

RPD = relative percent deviation

Method Summary (adapted from Harp 1994):

- collect sample in dark bottle and analyze within 15 minute holding period
- determine reagent blank at 515 nm wavelength
- add buffer and DPD solution to 50 ml sample and allow three-minute reaction period
- during reaction period, filter 50 ml of untreated sample and "zero" spectrophotometer
- analyze filtered treated sample after three minutes
- correction for 1) reagent blank value, 2) any chemical interferences, and 3) standard curve results

Trade names are provided for information only and do not imply a government endorsement.

Field validation of selected DPD spectrophotometric approach was conducted at sites in the habitat range of the federally-listed Carolina heelsplitter (Lasmigona decorata) and dwarf wedgemussel (Alasmidonta heterodon).

Exceedences of standards found at only 2 of 15 sites over a 12 month period.

TRC concentrations exceeding the NC water quality standard of 17 ppb were found in 10% of samples (range of exceedences 50 to 302 ppb) at these 2 sites.

Elevated TRC was assessed along a gradient downstream of a wastewater treatment plant (WWTP) outfall.

TRC results recorded along a downstream gradient from a WWTP outfall on Goose Creek, 8/12/2002

Station	TRC (ppb)
Goose Creek at WWTP outfall pool	180
Goose Creek at WWTP outfall pool - replicate	163
Goose Creek 100 meters below WWTP	BDL
Goose Creek 300 meters below WWTP	43
Goose Creek 400 meters below WWTP	BDL

BDL = Below method detection limit (calculated MDL = 8.7 ppb)

TRC levels were below the MDL at all sample locations except at a site 300 m downstream.

Effluent pooling may have occurred. Additional sampling along horizontal and downstream gradients is needed to determine the extent of the stream affected by elevated chlorine residuals.

Conclusions

The DPD colorimetric low-level chlorine detection protocol is preferable to amperometric titration alternatives for field analysis (due to reliability, demonstrated ease of use, and improved field performance).

Notable exceptions exist (waters characterized by high turbidity or discharges containing color).

Based on 1) elevated TRC concentrations in habitat supporting federally-listed mussels and 2) the potential for chlorine impacts to vary with stream conditions, additional study is needed to evaluate instream chlorine persistence.

This approach is likely to be useful for various applications including routine discharge monitoring and assessment of chlorine toxicity threats to mussels and other fauna.

References

Harp, D.L. 1994. Measuring trace levels of total residual chlorine in wastewater. Water Environment Laboratory Solutions. January/February 1994: 4-5.

U.S. Environmental Protection Agency. 1983. Methods for Chemical Analysis of Water and Wastes. Revised March 1983. EPA 600/4-79-020. Method 330.5. Chlorine, Total Residual - Spectrophotometric. USEPA, Cincinnati, OH.

_____. 1985. Ambient water quality criteria for chlorine. EPA 440/5-84-030. Office of Water, Criteria and Standards Division, Washington, DC.

Attachment 3

Table 5.1. Comparison of the relative toxicity of intermittent and continuous exposures of monochloramine to four test species during side-by-side toxicity tests.

Test Species	End point[a]	LC50 (ug/L) Intermittent	LC50 (ug/L) Continuous	Ratio[c]
Acute				
Common shiner	96- and 120-hr	345	71	4.85
Rainbow trout	96-hr	761	111	6.85
	120-hr	739	107	6.91
G. livescens	96-hr	>4600[b]	45	>100
Daphnia magna	48-hr	108	34	3.18
	72-hr	107	26	4.12
Chronic				
Rainbow trout-ELS	20-dph	>677[b]	74	9.15
	60-dph	449	57	7.88
D. magna	21-day	84	18	4.66

[a]Estimate for the standard acute test end point is listed first followed by the estimate for the final observation time when delayed mortality was observed; the ELS test was divided into two phases which included LC50's for 0-20 and 21-60 days posthatch (dph).

[b]LC50 was not calculated; given is the highest TRC concentration tested when no exposure concentration achieved 50 percent mortality at the end point.

[c]Intermittent LC50 divided by continuous LC50.

Attachment 4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 11 1990

OFFICE OF WATER

MEMORANDUM

SUBJECT: Chlorine Criteria: Consideration of Intermittent Discharges

FROM: LaJuana S. Wilcher
Assistant Administrator (WH-556)

TO: Water Management Division Directors (Regions I-X)
State Water Pollution Control Administrators

The purpose of this memorandum is to provide you with information and guidance on developing site specific criteria to protect water quality from intermittent point source discharges of chlorine, such as certain discharges from the steam electric utility industry.

Background

The EPA's aquatic life criteria guidance documents present an acute and a chronic criterion, each with specified measurement and exceedence parameters. Generally the guidance limits exceedence of the acute criterion to no more than once every three years, for a measured one hour average. The Utilities Water Act Group (UWAG) has suggested that EPA develop a chlorine criterion with measurement and exceedence parameters more tailored to the pulse discharges typical of the steam electric industry. While EPA is not currently reconsidering the chlorine criteria document, we do wish to point out potential mechanisms for addressing UWAG's concerns, if a State so chooses, at the local level.

Technically, a chlorine standard could be derived which would accommodate relatively higher peak levels, such as those caused by periodic cleaning, while maintaining long term levels low enough to protect against environmental impact. UWAG has done some scientific work toward establishing a basis for such revisions of our criteria. Following its evaluation, our Duluth laboratory has

determined that this work demonstrates the potential applicability of this concept, but that additional data evaluation would be useful. Nonetheless, the UWAG work did provide very useful data.

In order for a State to do a revision of the chlorine water quality criteria, some scientific work would be needed. This could involve factors such as site specific modeling, and consideration of local sensitive species for the waterbody subject to the standard.

As stated in the most recent draft of EPA's Technical Support Document for Water Quality-Based Permit Limits (55 FR 19662), not only criteria concentrations but also exceedence parameters may be adjusted on a site specific basis, if sound data so indicate. While EPA cannot give a blanket approval to such modifications at this time, I note that they are acceptable in principle. I also note that some evidence exists that some environments can tolerate short term exceedences of our existing chlorine criteria, provided that they are followed by suitable recovery periods, and that situations involving periodic cleaning with chlorine may be good candidates for such site specific modifications of the chlorine criteria.

If you have any questions, please feel free to contact me, or have your staff telephone Dr. Robert April at 202-475-7315.

cc: Martha Prothro
Bill Diamond

Attachment 5

Cost Estimates for Dechlorination System at Harbor & Haynes Generating Stations

Harbor

Capital Cost in 2006$	**Total**
Dechlorination system	120000
Continuous Chlorine Monitoring System	40000
Piping & Valves	36000
Control integration & data logger	10000
Field Labor (Mech/Elect/I&C)	128000
Engineering (PM/Mech/I&C/Elec)	80000
	414000
Project Contingencies (20%)	82800
	496800
Annual O&M (in 2006 $)	
Additional Plant support (I&C, O&M)	12000
Chemicals used (gal)	15000
	27000

Haynes

Capital Cost in 2006$	**Total**
Dechlorination system	360000
Continuous Chlorine Monitoring System	120000
Piping & Valves	108000
Control integration & data logger	30000
Field Labor (Mech/Elect/I&C)	320000
Engineering (PM/Mech/I&C/Elec)	128000
	1066000
Project Contingencies (20%)	213200
	1279200
Annual O&M (in 2006 $)	
Additional Plant support (I&C, O&M)	24000
Chemicals used (gal)	60000
	84000